OSHA's New Beryllium Rule

Understanding and Preparing your Workplace for Abrasive Blasting Operations

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Table of Contents

Abstract

According to OSHA, approximately 11,500 Americans are exposed to beryllium during abrasive blasting operations. Beryllium is a grey metal present in small quantities (0.0002%) in the Earth's crust. Beryllium dust poses a health hazard to humans.

Due to the risks of beryllium exposure in abrasive blasting and other industry practices, the Occupational Safety and Health Administration (OSHA) has lowered the limit for beryllium exposure. The new OSHA regulations reduced the previous exposure limit from 2.0 $\mu g/m^3$ to 0.2 $\mu g/m^3$, for an eight-hour time-weighted average.

Organizations can implement several steps and controls to anticipate, identify, and mitigate risks of beryllium dust exposure within their blasting operations. Controls methods include elimination, substitution, engineering, administrative controls, and Personal Protective Equipment (PPE). Replacing high beryllium content waste slag abrasives with low beryllium content garnet abrasives is the fastest, most efficient way to reduce employees' exposure to potential airborne health hazards.

Introduction

This white paper aims to help safety and environmental professionals understand the requirements of the new OSHA beryllium standard and actions to prevent beryllium exposures.

Safe practices before and during abrasive blasting are a key component to protecting employees' health and the environment.

The easiest way to safeguard employees and comply with the OSHA beryllium standard is to use the hierarchy of controls and substitute high beryllium content waste slag blasting media with those that contain significantly less beryllium. Next, implementing proper engineering, administrative controls, and PPE can also drastically reduce the risk of hazardous beryllium exposure.

Of the 62,000 workers estimated to be exposed to beryllium, approximately 11,500 exposures occur during abrasive blasting.

What Is Beryllium?

Beryllium is a naturally occurring element. It is a lightweight but strong heavy metal that is dangerous and commonly present in waste slag abrasives (particularly coal slag but also copper slags and nickel slag).

OSHA estimates that nationally approximately 62,000 workers are potentially exposed to beryllium at roughly 7,300 sites. Of the 62,000 workers estimated to be exposed to beryllium in the US, approximately 11,500 exposures occur during abrasive blasting operations. Potentially, workers' family members are exposed to beryllium contaminants clinging to clothing, equipment, or vehicles.

What Are the Health Hazards of Beryllium?

Chronic Beryllium Disease (CBD) is a common but serious illness that can occur in individuals with beryllium exposures. Patients with CBD can experience chest pain, coughing, night sweats, fatigue, and weight loss. Symptoms could develop within months of first exposure or decades after the first exposure. Usually, individuals first become sensitized to beryllium through inhalation or skin exposure before they develop CBD.

About two to six percent of beryllium-exposed people develop **beryllium sensitization**, with most sensitized people progressing to CBD.

The History of the New OSHA Standard

OSHA first proposed its beryllium rule in 1975. Several factors delayed that rule, and since then additional studies have shed more light on the hazards of beryllium, safe levels of exposure, and how to protect workers.

The original rule proposed to cut the eight-hour

TIMELINE

1930s-1940s
45 light industry workers develop ABD.

1977
NIOSH recommends 0.5 µg/m^3 as the new occupational standard.

1998
The Department of Energy & NIOSH propose a limit of 0.5 µg/m^3.

1999
OSHA updated the 0.5 µg/m^3 standard.

2017
Jan – OSHA's final rule on BE for general industry, construction and shipyards.

2018
Dec – OSHA's new rule for general industry.

2019
Mar – OSHA enforces general industry provisions for change rooms and showers.

Sep – OSHA adopts the final rule for construction and shipyards.

2020
Mar – OSHA enforces engineering controls for BE in general industry.

Sep – Final BE rule goes into effect for all industries.

2021
Sep – Anticipated date to enforce all provisions of BE rules in all industries.

BE = Beryllium
ABD = Acute Beryllium Disease
CBD = Chronic Beryllium Disease

permissible exposure limit from 2.0 micrograms of beryllium per cubic meter of air to 1.0 micrograms, aiming to address the alleged cancer risks. Scientists from OSHA and the National Institute for Occupational Safety and Health completed the cancer study.

However, individuals raised concerns about the quality of the study, which the beryllium industry had requested. While the idea that beryllium is a carcinogen has been debated, it has been proven that beryllium exposure can cause chronic beryllium disease.

Since 1975, we learned that there is a safe exposure level for beryllium. A 2007 study showed that chronic beryllium disease occurred at exposures over 0.4 micrograms per cubic meter of air. The final rule sets the permissible exposure limit for beryllium at half that – 0.2 micrograms per cubic meter of air, averaged over eight hours.

The New OSHA Beryllium Standard

On July 14, 2020, OSHA published a final rule revising the beryllium standard for general industry.

Key provisions:

- The permissible exposure limit for beryllium is 0.2 micrograms per cubic meter of air averaged over eight hours.
- The short-term exposure limit for beryllium is 2.0 micrograms per cubic meter of air over 15 minutes.

In addition, it requires employers to:

- Anticipate hazards
- Develop a written exposure control plan
- Provide workers with beryllium-specific training
- Prepare workplaces (as detailed in the Code of Federal Regulations (CFR))
- Limit access to high-exposure areas
- Provide respirators

- Update the blasting process related to potential beryllium exposures
- Coordinate appropriate disposal for environmental considerations.

If workers are exposed, employers must provide medical exams to monitor them and offer medical removal protection to workers with a beryllium-related disease.

The regulations are tailored to each industry.

- 29 CFR 1910.1024 regulates beryllium exposure for general industry.
- 29 CFR 1926.1124 regulates beryllium exposure for the construction industry.
- 29 CFR 1915.1024 regulates exposure for the shipyard industry.

OSHA estimates that each year the final rule will save the lives of 90 workers from beryllium-related diseases and prevent 46 new cases of chronic beryllium disease.

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How This Rule Impacts Beryllium's Use in Abrasive Blasting

Blasting has long been associated with potential beryllium exposures. In particular, waste slag blasting poses increased health hazards. Slags can have a variety of contaminants such as lead, arsenic, beryllium, cadmium, and others – but choosing a safer blasting media can drastically reduce the amount of contaminant exposure while blasting.

While there are many ways to decrease beryllium exposure, the easiest and a most efficient option for oil and gas (and industrial facilities) to comply with the new OSHA standard is to simply use a substitute blast media instead of beryllium-heavy slag abrasives. Specifically, garnet abrasive, a natural mineral solution, is safer for both the employee and the environment.

Preparing for the New OSHA Rule in Abrasive Blasting

Safety starts well before the job begins. Important dates for beryllium compliance requirements:

- The original rule went into effect on May 20, 2017, and the standards were updated September 14, 2020.
- OSHA is currently enforcing beryllium prolonged exposure limits for construction and shipyard industries.
- OSHA will enforce most provisions one year after the effective date.
- Employers must provide change rooms and showers within two years after the effective date.
- OSHA requires compliance with the engineering controls provision within three years after the effective date.

This rule is expected to yield $2.5 million in total annualized cost savings for employers in terms of employee health.

Benefits and Challenges

Although this rule is expected to yield $2.5 million in annual cost saving to employees' health in the shipyard and construction sectors, upfront costs of implementation are estimated to be as much as $1,000 per employee each year. Cost savings are anticipated to take effect in the form of reduced worker health impacts.

Substitution is usually the most effective and efficient method to reduce beryllium exposure in the workplace, decreasing the need for engineering controls, administrative controls, and PPE.

Employers' Responsibilities

To prevent sensitization to beryllium, subclinical CBD, and clinical CBD, worksites must control and limit employee beryllium exposure.

Employers must:

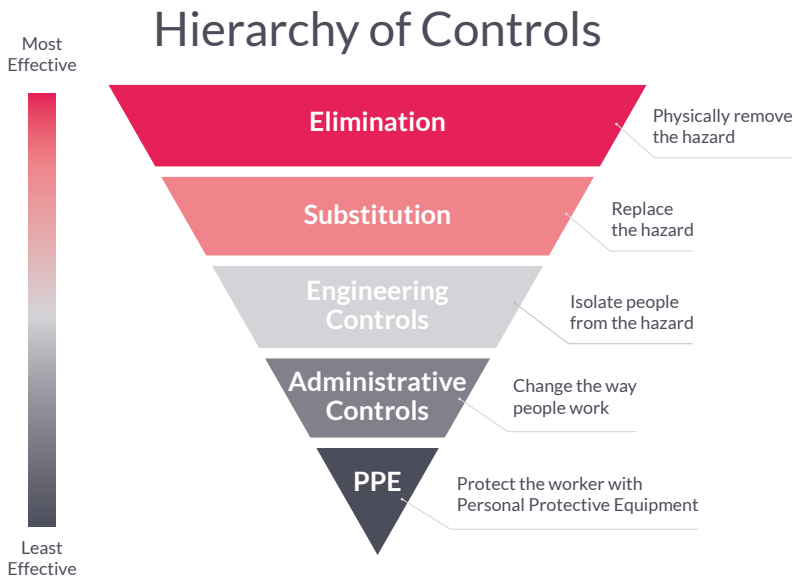
- Anticipate hazards
- Develop a written exposure control plan
- Provide workers with beryllium-specific training
- Prepare the workplace (as detailed in the CFR)
- Update the blasting process related to potential beryllium exposures
- Coordinate appropriate disposal for environmental considerations.

The Brush Wellman's Beryllium Worker Protection Model focuses not only on keeping beryllium work areas clean but also on keeping beryllium particles and solutions off workers' lungs, skin, and clothing. Workers and supervisors' training and motivation are essential components of this model's success. Together with a combination of engineering, administrative, and PPE controls, this can reduce potential occupational beryllium health hazards.

Taking steps to ensure workplace safety will reduce potential health-related workers' compensation, protect an organization's corporate reputation, and ensure compliance with the latest OSHA regulations.

Step 1: Hazard Anticipation and Identification

The first step is to recognize that abrasive blasting creates dust and companies need to address these hazards according to OSHA's **hierarchy of controls** (image below).



Companies must protect employees who handle potential beryllium-containing products at all stages of their blasting operations (i.e. from use to disposal). Elimination and substitution control strategies are by far the most effective methods to prevent beryllium exposure.

Substitution is often less expensive and more effective than other controls.

How can you identify products that introduce the fewest hazards?

1. Look for substances with low friability (i.e. tendency to shatter). These substances produce less dust, which can impact visibility and create airborne hazards.
2. Examine the levels of heavy metal content in abrasive blasting media. Waste slag abrasives contain higher concentrations of heavy metals, including beryllium.

3. Review safety data sheets and other resources such as the CDC pocket guide of hazardous substances before bringing potentially hazardous blasting media on-site.
4. Work with vendors and manufacturers to identify safer products.
5. Substitute highly hazardous blasting media for safer alternatives (i.e. replace slag abrasives with garnet).

When choosing to substitute slag abrasives with a less hazardous product, garnet is a cost-effective, powerful abrasive. For example, GMA Garnet™ conducted sampling of its products for 120 minutes. Results indicated that GMA Garnet™ products were under the OSHA limit for beryllium. In addition, they produce less dust, have low toxicity and are highly efficient.

Step 2: Hazard Mitigation

Safety managers must mitigate risks and hazard exposure once a blasting media is brought on-site.

Engineering Controls

To protect blasters and those who may be exposed through other tasks, organizations can implement engineering controls. They must begin planning these controls long in advance since these systems take the longest to design and implement.

Budget is an important consideration for engineering controls. This also requires coordinating with multiple disciplines (engineers, employees, safety and environmental professionals, and management).

Some engineering controls examples:

- Building local exhaust ventilation to capture and remove airborne emissions
- Having machine guards to shield the worker
- Isolating the blasting process by building a blast room.

Administrative controls solely rely on human behavior, they are not as effective as substitution or engineering controls at reducing exposure risks.

Administrative Controls

Administrative controls mitigate hazards by changing the actions of employees. However, this method solely relies on human behavior and is not as effective as substitution or engineering controls at reducing exposure risks.

Some examples of administrative controls include:

- Establishing safe work areas and restricting access by signage
- Implementing blasting procedures
- Adjusting schedules to blast when the site is less busy
- Training employees on hygiene practices to protect their health.

When engineering controls are not feasible, it may be advisable to implement administrative controls throughout the process to prevent beryllium exposures.

OSHA recommends banning eating, drinking, and smoking near blast areas and cleaning or removing contaminated clothing before eating, drinking, or smoking. Employers should also provide hand-wash stations for cleaning and sanitization.

For cleanup, OSHA recommends using wet methods, such as HEPA-filtered vacuuming.

All employees who may be exposed to beryllium need to be trained on the hazards of the substance and how to protect themselves from beryllium.

Finally, employers must ensure all abrasive blasting protocols defined by OSHA are in place.

Personal Protective Equipment (PPE)

PPE is the last line of defense against exposures (respiratory and skin protection). The Respiratory Protection Standard (29 CFR 1910.134) defines rules and best practices, including NIOSH-approved respirators for blasters.

Skin protection includes proper:

- Eye and face protection
- Gloves

- Aprons or blast suits
- Safety shoes or boots.

Hearing protection should also be worn as needed according to noise levels.

It is also important to protect workers who do not conduct blasting but could be exposed to beryllium by preventing cross-contamination on protective gears.

Step 3: Disposal Considerations

Once blasting is complete, safety does not end. It is a requirement that operators dispose of or recycle used abrasives properly. Garnet is a superior abrasive blasting media for recycling. It is environmentally inert, making disposal worry-free and less costly.

Preparing for OSHA's New Beryllium Rule with Safer Products

Complying with OSHA's new ruling begins with choosing the safest blasting media. It results in fewer workplace changes and lowers overall compliance costs.

Protecting workers is vital; garnet abrasives are a safer alternative. Not only can garnet abrasives eliminate or reduce beryllium exposure, they are also less friable, which means less dust creation while blasting than with slag abrasives. Studies showed GMA Garnet™ beryllium levels are well below the OSHA limits.

Additional benefits of using GMA's abrasives include increased productivity (higher blasting rates), getting the job finished faster, and lower abrasive consumption, which ultimately reduces the time and effort of cleanup.

Make the Best Choice by Choosing GMA Garnet™

GMA has been in business for over 35 years, supplying high-quality garnet abrasives. Find out more about how we can work together to keep your worksite and workers safe when using GMA Garnet™ abrasives.

About the Author

Pete Mitchell is the Vice President of New Market Development and Technical Management at GMA Americas. Pete's industry experience spans over 25 years, and he is actively involved in several industry-related professional bodies such as WJTA, NACE, SSPC, the Houston and Louisiana Coatings Society as well as a USA standards team that works with the International ISO standards board.

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